

## Solar Nexus? Assessing the Association between Sun Exposure and Breast Cancer Risk

Lindsey Konkel

<https://doi.org/10.1289/EHP6892>

Although solar ultraviolet (UV) radiation is known to cause skin cancer,<sup>1</sup> there is evidence that the sun's rays may also have a protective effect on other cancers, including breast cancer.<sup>2</sup> However, the literature on breast cancer and solar radiation has yielded mixed results. A recent systematic review and meta-analysis reported in *Environmental Health Perspectives* explored possible reasons for these mixed results and estimated breast cancer risk associated with various sun exposure scenarios.<sup>3</sup>

Breast cancer is the most commonly diagnosed cancer among women worldwide.<sup>4</sup> Established genetic and environmental risk factors for breast cancer include advanced age, having a family history of breast cancer, genetic mutations in key tumor suppressor genes (including *BRCA1* and *BRCA2*), high alcohol intake, smoking, obesity, reproductive factors (such as early menarche and late menopause), and physical inactivity.<sup>5</sup> Modifiable risk factors are estimated to account for only about a third of breast cancer cases.<sup>6</sup>

The authors identified more than 1,800 potentially relevant studies. They limited their review and meta-analysis to prospective and case–control human studies that included an estimation of solar UV radiation exposure via time spent in the sun or ambient UV radiation (based on latitude or satellite data). Because of the potential influence of UV radiation on cancer survival, and because

breast cancer tends to have a relatively good prognosis, they omitted papers that assessed deaths as an outcome. Ultimately, they included 13 papers in the meta-analysis covering eight populations in North America, four in Europe, and one in Iran. These populations included both pre- and postmenopausal women, the majority of whom were Caucasian.

After pooling the results from different studies, the researchers estimated that women who reported spending at least 1 hour per day in the sun during the summer months had a 16% lower likelihood of developing breast cancer, compared with those who reported spending less than that. However, spending more than 2 hours per day in the sun did not further reduce the risk as compared with less than 1 hour. “It’s important that we found a potential benefit up to a point—we didn’t find more benefit with more sun exposure,” says study coauthor Dylan O’Sullivan, a Ph.D. candidate in epidemiology at Queen’s University in Ontario, Canada.

When the researchers analyzed sun exposure during different life periods, they found that exposure during adolescence and early adulthood was more strongly associated with a lower risk of breast cancer than sun exposure after 45 years of age. This highlights a potentially important exposure window around the time of puberty.

However, the current results leave much to be discovered. For example, the findings are primarily generalizable to White women



A new meta-analysis suggests that getting at least 1 hour of sun exposure per day in summer may decrease the risk of breast cancer. But it's not clear whether sun exposure itself or some related factor, such as physical activity, is responsible for the potential benefit. Image: © iStockphoto/Imgorthand.

living at northern latitudes. Future studies should include more geographically and racially diverse populations. Hormone receptor status, menopausal status, and income—which might affect the amount of leisure time spent outdoors—are other important factors to consider.

It's not clear why sun exposure would contribute to lower breast cancer risk. Experimental evidence suggests that vitamin D may play a mediating role, with greater amounts of time spent in the sun presumably resulting in higher levels of vitamin D.<sup>7</sup> Some research points toward a reduction in breast cancer risk with increasing levels of vitamin D,<sup>8</sup> although a recent review found no clear relationship between the two for any subtype other than triple-negative breast cancer (i.e., breast tumors that are not hormone dependent).<sup>9</sup>

Another possibility is that UV exposure could be a marker for some other factor tied to lower breast cancer risk. Maybe people who are exposed to the sun more tend to be more physically active, and the physical activity rather than the UV exposure itself is driving the apparent risk reduction, explains Julia Knight, a cancer epidemiologist at the Lunenfeld-Tanenbaum Research Institute at Sinai Health System in Toronto. "It's possible that people who spend more time outdoors are healthier for a bunch of reasons. Trying to tease out those coexposures is tricky," says Knight, who was not involved in the meta-analysis.

Most [cancer] risk factors, such as smoking, go in only one direction—the factors either increase or decrease the risk of certain cancers, but not both, says O'Sullivan. "Sun exposure is an interesting exposure in that it may be both detrimental and beneficial," he says.

O'Sullivan cautions that more research is needed on time spent in the sun and noncutaneous cancers before making any recommendations on whether to use sunlight to reduce breast cancer risk. "People want a clear message, but there's a lot we don't

understand," Knight adds. "We know there are definite cancer risks from UV exposure, but total avoidance may not be the answer."

---

**Lindsey Konkel** is a New Jersey-based journalist who reports on science, health, and the environment.

## References

1. International Agency for Research on Cancer. 1992. *Solar and Ultraviolet Radiation*. [https://publications.iarc.fr/\\_publications/media/download/1884/4a87c098b4b16dbb0dc18bd9a975ccffc8d8cc64.pdf](https://publications.iarc.fr/_publications/media/download/1884/4a87c098b4b16dbb0dc18bd9a975ccffc8d8cc64.pdf) [accessed 27 August 2020].
2. van der Rhee H, Coebergh JW, de Vries E. 2013. Is prevention of cancer by sun exposure more than just the effect of vitamin D? A systematic review of epidemiological studies. *Eur J Cancer* 49(6):1422–1436, PMID: 23237739, <https://doi.org/10.1016/j.ejca.2012.11.001>.
3. Hiller TWR, O'Sullivan DE, Brenner DR, Peters CE, King WD. 2020. Solar ultraviolet radiation and breast cancer risk: a systematic review and meta-analysis. *Environ Health Perspect* 128(1):016002, PMID: 31903801, <https://doi.org/10.1289/EHP4861>.
4. World Health Organization. 2020. Breast cancer: prevention and control. [Website.] Geneva, Switzerland: World Health Organization. <https://www.who.int/cancer/detection/breastcancer/en/> [accessed 25 August 2020].
5. Sun Y-S, Zhao Z, Yang Z-N, Xu F, Lu H-J, Zhu Z-Y, et al. 2017. Risk factors and preventions of breast cancer. *Int J Biol Sci* 13(11):1387–1397, PMID: 29209143, <https://doi.org/10.7150/ijbs.21635>.
6. Tamimi RM, Spiegelman D, Smith-Warner SA, Wang M, Pazaris M, Willett WC, et al. 2016. Population attributable risk of modifiable breast cancer risk factors in postmenopausal breast cancer. *Am J Epidemiol* 184(12):884–893, PMID: 27923781, <https://doi.org/10.1093/aje/kww145>.
7. Lopes N, Paredes J, Costa JL, Ylstra B, Schmitt F. 2012. Vitamin D and the mammary gland: a review on its role in normal development and breast cancer. *Breast Cancer Res* 14(3):211, PMID: 22676419, <https://doi.org/10.1186/bcr3178>.
8. Estébanez N, Gómez-Acebo I, Palazuelos C, Llorca J, Dierssen-Sotos T. 2018. Vitamin D exposure and risk of breast cancer: a meta-analysis. *Sci Rep* 8(1):9039, PMID: 29899554, <https://doi.org/10.1038/s41598-018-27297-1>.
9. Tommie JL, Pinney SM, Nommsen-Rivers LA. 2018. Serum vitamin D status and breast cancer risk by receptor status: a systematic review. *Nutr Cancer* 70(5):804–820, PMID: 29781719, <https://doi.org/10.1080/01635581.2018.1470653>.